DOE/EA-1402 (DRAFT)

ENVIRONMENTAL ASSESSMENT

METHANE ENERGY and AGRICULTURAL DEVELOPMENT
PORT of TILLAMOOK BAY
DAIRY DIGESTER PROJECT

TILLAMOOK COUNTY, OREGON

October 2001

U.S. Department of Energy
National Energy Technology Laboratory

National Environmental Policy Act (NEPA) Compliance
Cover Sheet

Proposed Action:
The U.S. Department of Energy (DOE) proposes to provide funds for the construction and start-up of a manure digester at the Port of Tillamook Bay (POTB) Industrial Park, Tillamook County, Oregon. If approved, DOE would provide funding to construct this dairy digester, which would produce the following marketable products; 295 kW of electric power from biogas, hot water used to maintain the temperature of the digester, and about 30 cubic yards per year of solids for composting.

Type of Statement: Environmental Assessment

Lead Agency: Department of Energy; National Energy Technology Laboratory (NETL)

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Abstract:
DOE's objective in funding the dairy digester construction is to demonstrate a proven technology for processing farm animal manure from 2,000 mature Holstein cows, while simultaneously producing clean, renewable electrical power and other marketable products. The project would mitigate some potential environmental risks (such as reduction of pathogens) associated with current land applications of manure, in which water runoff can contribute to the contamination of rivers in the Tillamook watershed. In addition, the 160 dairy farmers in Tillamook County have serious problems with storage of manure, particularly in the winter months when precipitation is significant. Providing a storage option for farmers in these months may prove to be a significant benefit to both the farmer and water quality.

The new plug-flow dairy digester would be located on about four acres of a 7.5-acre concrete pad located at the POTB Industrial Park. The environmental analysis identified that the most notable potential impacts from the proposed project would occur in the following areas: air quality from releases of carbon monoxide, sulfur dioxide, nitrogen oxides, and particulate matter that are well below all state and Federal regulatory limits, and water quality where there is a potential benefit due to reduction of the pathogens in the runoff.

Public Comments:
DOE encourages public participation in the NEPA process. A draft Environmental Assessment will be released on October 11, 2001; comments are requested by October 29, 2001. The Environmental Assessment will be available from the DOE's NETL website (www.netl.doe.gov), the Tillamook County Library, and the Tillamook Campus Library, and notices for review will be published in the Headlight Herald on October 10, 2001. Copies of the Assessment will be distributed to the applicable Federal and State agencies and the POTB Industrial Park. Copies of the comments will be included in Appendix B of the final EA.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

$\mu g/m^3$	Micrograms per cubic meter
µm	Microns
ACDP	Air Contaminant Discharge Permit
BPA	Bonneville Power Administration
Btu	British thermal unit
Btu/ft^3	British thermal unit per cubic foot
CAA	Clean Air Act
CAFO	Confined Animal Feeding Operations
CFR	Code of Federal Regulations
CO	Carbon monoxide
CO_2	Carbon dioxide
CWA	Clean Water Act
DB	Decibel
dBA	A-weighted decibel scale
DEQ	Department of Environmental Quality (State of Oregon)
DO	Dissolved oxygen
DOA	Department of Agriculture (State of Oregon)
DOE	U.S. Department of Energy
EA	Environmental Assessment
EPA	Environmental Protection Agency
FONSI	Finding of No Significant Impact
FR	Federal Register
ft^3	Cubic feet
ft^3/d	Cubic feet per day
GWP	Global warming potential
H_2S	Hydrogen sulfide
Hz	Hertz
kV	Kilovolt
kVA	Kilovolt ampere
kW	Kilowatt
lb/CY	Pounds per cubic yard
lb/gal	Pounds per gallon
MEAD	Methane Energy and Agricultural Development
mg/m^3	Milligrams per cubic meter
MMBtu	Million British thermal units

MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NDPES	National Pollution Discharge Elimination System
NEPA	National Environmental Policy Act
N_2O	Nitrous oxide
NO_2	Nitrogen dioxide
NO_X	Oxides of nitrogen
NRCS	Natural Resource Conservation Service
NSR	New Source Review
O_3	Ozone
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
Pb	Lead
ph	Measurement of acidity or alkalinity of a solution
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to.5 microns
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 microns
POTB	Port of Tillamook Bay
ppb	Parts per billion
ppm	Parts per million
PUD	Public Utility District
PVC	Polyvinyl chloride
RCM	Resource Conservation Management Digesters, Inc.
RFP	Request for Proposal
SO_2	Sulfur dioxide
TCCA	Tillamook County Creamery Association
TMDL	Total Maximum Daily Load
tpy	Tons per year
UPS	United Postal Service

1.0 INTRODUCTION

This Environmental Assessment (EA) provides results of an analysis of the potential environmental impacts from the proposed construction and operation of the Methane Energy & Agricultural Development (MEAD) Port of Tillamook Bay (POTB) Dairy Digester Project in Oregon. If approved, the U.S. Department of Energy (DOE) would provide partial funding for construction of the dairy digester. The POTB, an Oregon Municipal Corporation, would be responsible for construction, operation, and maintenance of the dairy digester.

The purpose of the MEAD POTB Dairy Digester Project (hereafter referred to as the Dairy Digester Project) is to demonstrate the viability of processing raw manure from the farming community and to document the environmental and economic benefits of the project. The digester would generate biogas for electricity and hot water. DOE funding would only support the construction phase. The POTB expects the digester to be economically self-sustaining due to income from electric power production and compost fiber sales.

The purpose of this EA is to determine if the proposed project could potentially cause significant impacts to the environment. If potentially significant impacts are identified, and if they cannot be mitigated or avoided, then a more detailed Environmental Impact Statement would be prepared. If no significant impacts are identified, a Finding of No Significant Impact (FONSI) would be prepared and made available to the public, along with the EA itself, before DOE provides funds for construction.

This study was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code 4321 *et seq.),* the Council on Environmental Quality Regulations (Title 40, Code of Federal Regulations (CFR), Parts 1500-1508), and the Department of Energy's NEPA Implementing Procedures (Title 10, CFR, Part 1021).

2.0 PURPOSE AND NEED FOR AGENCY ACTION

This project would be consistent with DOE's missions to ensure energy availability and to develop domestic renewable energy resources. DOE's policy relating to biomass is consistent with Executive Order 13134 "Developing and Promoting Biobased Products and Bioenergy," which promotes renewable farm resources in the production of energy. The Dairy Digester Project would be consistent with the objectives of DOE's Biopower Program to encourage energy self-reliance, generate employment, improve air quality, and reduce greenhouse gases. The Biopower Program provides funds for demonstration projects and proven commercial applications for alternative and "green" energy sources (i.e., energy derived from renewable sources, which significantly reduces pollutants into the environment). Dairy digesters, using cow manure as the fuel, are a proven technology in the U.S. and other countries. However, a centralized digester using manure from several farms at one facility has not been constructed in the U.S. Without Federal funds, this project would not be constructed.

DOE identified this opportunity through the POTB Municipal Corporation. Local organizations such as the City of Tillamook, the Tillamook County Creamer Association (TCCA), and the Tillamook County Soil and Water Conservation District have supported research, design, and development funding for various centralized digester projects. They believe important benefits would result from constructing a centralized digester in Tillamook County, including the reduction of manure-related odors, pathogenic organisms, fiber, and weed seeds; better documentation of manure nutrient characteristics on farms; production of "green" electricity; and improved manure storage.

The Dairy Digester Project would demonstrate cheap and simple processing of farm animal manure from 2,000 mature Holstein cows, while simultaneously producing clean, renewable electrical power and other marketable products. The project would mitigate some potential environmental risks (such as reduction of pathogens) associated with current land applications of manure, in which water runoff can contribute to the contamination of rivers in the Tillamook watershed. In addition, the 160 dairy farmers in Tillamook County have serious problems with storage of manure, particularly in the winter months when precipitation is significant. Providing a storage option for farmers in these months may prove to be a significant benefit to both the farmer and water quality.

With proper management oversight, there is a high probability of success with this project, given that the design is based upon working European technology for anaerobic digesters. The proposed approach is to prove the success of this small digester, gain the confidence of local farmers and regulators, and provide a sound technical and environmental basis for future commercial application of the technology. Compared to previous designs (see Section 3.1, Project Background), this "modular approach" would include costs of construction, and the transport costs would be covered by project proceeds without any cost to participating farmers.

DOE's decision is whether to provide the funding for the construction of this centralized dairy digester. The POTB would be the responsible party for operation and maintenance of the digester, with the assistance of their technical consultants for the first six months.

2.1 INTERNAL SCOPING

Internal scoping activities were conducted to identify significant issues associated with the proposed project. This effort was based upon the review of the technology, construction requirements for the site, the environmental setting, and background documents from previous feasibility studies associated with conceptual digester projects.

Scoping activities included: extensive interviews with the local and state regulators and farmers in the area, DOE review of the technical reports regarding the local farm ecology and dairy digesters, and an on-site visit at the proposed location.

2.2 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

Extensive materials were provided by the POTB from past project proposals and the current Dairy Digester project. DOE arranged a site visit to Tillamook Bay, Oregon, in July 2001. While in Tillamook, additional materials were collected from local, state, and Federal agencies, and numerous interviews were conducted (see Section 10.0, List of Agencies and Individuals Contacted). Based upon these secondary sources and interviews, a list of resources of concern and a methodological approach to the EA were prepared. First, those resources that were not expected to be of concern in the analysis were identified. The following resources areas were not analyzed in detail: floodplain/wetland, soils and geology, aesthetics and land use, noise, flora and fauna, historical and cultural.

No adverse pollution prevention or environmental justice issues could be identified; therefore, none were analyzed. The project would create renewable energy, would not involve the use of hazardous materials, would not generate wastewater, and would reduce the presence of bacteria from processed manure, and it thereby represents a favorable pollution prevention strategy. The POTB has an existing recycling program for their operations and the Dairy Digester Project would operate under existing procedures.

Environmental Justice, as described in Executive Order 12898, calls for the fair treatment and involvement of all people regardless of race, ethnicity, culture, income, or education level with respect to environmental laws, regulations, and policies. The expected emissions from air pollutants would not move offsite to any cluster of minority populations. No disproportionately high or adverse impacts on low-income minority populations would result from the proposed action.

Though no impacts on flora and fauna and historical and cultural resources were expected, in order to comply with the NEPA regulations, coordination letters to the U.S. Fish and Wildlife Service and State Historic Preservation Officer were forwarded *(no response letters have been received to date.)* The key issues identified and analyzed for the proposed action included: air quality and odor, water quality, traffic and transportation, socioeconomic resources, and safety and health.

For those resources that needed detailed analysis, a framework was developed to provide qualitative indicators of the impact assessment or threshold analysis. The digester would be designed for the manure of about 2,000 cows, less than 7 percent of the total number of dairy cows in the county. Though the exact number of farms that would participate in this project is not certain to date, it would probably involve less than four percent of all dairy farms in the county (6 out of a total of 160 farms). Therefore, the potential impacts of processing raw manure from 2,000 cows are analyzed, in almost all resource areas, qualitatively. Qualitative analysis was applied for all resources except air

quality, for which quantitative information was available from an air permit submitted to the State Department of Environmental Quality (DEQ). Qualitative water resource analysis is provided in relation to runoff into streams and rivers from direct manure applications. Land application of manure is discussed, but only in relation to water quality, not soil impacts. Numerous studies document the deleterious effects of runoff from manure and sedimentation in the Tillamook Watershed, but establishing a direct cause-and-effect measurement is not possible [Oregon DOA, 1999; Oregon DEQ, 1/01; U.S. EPA 12/99]. Wherever possible, construction and operation impacts were distinguished.

For the affected environment, the region of influence considered was the boundaries of the Tillamook watershed and the county. Environmental consequences of the proposed action were evaluated for the project site area at the POTB.

Under the No Action Alternative, DOE would not fund the construction of the Dairy Digester and on-farm practices of applying raw manure and current storage practices would continue. It is clear from historical documentation of other project concepts and interviews that the POTB Dairy Digester Project would not be constructed without these funds. Therefore the No Action Alternative is a reflection of current conditions. The No Action Alternative is not analyzed separately because it is the same as the baseline environmental conditions in and around the POTB. The Affected Environment sections under each resource area represent the No Action Alternative.

3.0 DESCRIPTION OF THE ALTERNATIVES INCLUDING THE PROPOSED ACTION

DOE proposes to provide construction funds for the Dairy Digester Project to demonstrate the viability of a centralized system for processing cow manure and producing methane for electricity. The digester would be located at the POTB Industrial Park in Tillamook, Oregon, within a five-mile radius of the participating dairy farms.

This section will discuss the background of the project, details of the construction and operation, and the project location.

3.1 PROJECT BACKGROUND

Agricultural land use has contributed significantly to the coastal economy of Tillamook County since Euro-American settlement in the 19th Century. The number of farms and the land area used for farming has decreased since the 1950's due to the combination of small farms into larger commercial farms. According to the Natural Resource Conservation Service (NRCS) and the Tillamook County Creamery Association (TCCA), there are between 155-160 dairy-related farms in the watershed area, with the greatest concentrations along the Trask, Wilson, and Tillamook Rivers.

Most of the dairy farms have some facilities for livestock confinement and storage of animal wastes. Depending on individual site characteristics, dairies need adequate facilities to store livestock wastes for 100 or more days to avoid land application during environmentally fragile periods (high rainfall). While many of these operations may have had adequate facilities in the past, herd consolidations and expansion without increased farming facilities over the last decade led to inadequate storage facilities. Herd expansion in the future, however, will be limited by available acreage for manure application, permitting of dairy operations by the Oregon Department of Agriculture (DOA) (the Confined Animal Feeding Operations or CAFO permits), and stricter environmental regulations for water quality. It is often these environmental reasons, rather than the green energy generation potential, that motivates farmers to consider digester technologies [Oregon Office of Energy, 9/98].

Over the last 10 years, various public and private entities have tried to design and implement a dairy digester in the Tillamook area. In 1989, a committee identified potential environmental issues associated with manure management to be a significant risk to continued dairy farming in Tillamook County. The MEAD project was founded through an intergovernmental agreement between the Tillamook Public Utility District (PUD) and the Tillamook County Soil and Water Conservation District. Three requests for proposals (RFP) were issued in the 1990's in an attempt to build a centralized manure digestion facility in the county [Unisyn Biowaste Technology and Harris Group, 3/92 and 10/91 and Norwest, 11/95]. All endeavors involved high manure transport cost, debt service, and participant tipping fees. The projects were not constructed.

Craven Farms, a private dairy farm in Tillamook County, completed construction of an anaerobic digester at its main farm site in January 1997. In addition to reducing bacteria in the farm's manure, the digester system provided income to the dairy from electricity sold to the local PUD and fiber solids sold as animal bedding. The plug flow digester system, designed by Resource Conservation Management Digesters, Inc. (RCM), the designer of the current proposed project, produced heat for space heating in the milking parlor and for heating water [Oregon Office of Energy, 9/98]. This

project proved successful for a short time; however, a change of farm ownership shut down the operation in 2000.

Recently, the POTB revived discussions with county dairymen to encourage treatment of manure in a smaller, centralized digester facility. This effort scaled back the size of the digester so that costs of construction would be markedly lower and transport costs would be covered by project proceeds without any cost to the participating farmers. Dairymen are still interested because of the reduction of manure-related odors, pathogenic organisms, fiber, and better documentation of manure nutrient characteristics. The nutrient-rich liquid would be used for crop production and possibly provide better storage options in the wet season. The POTB hopes to demonstrate the viability of this technology and encourages an incremental approach whereby one additional digester would be constructed at the POTB and other digesters could be constructed at other locations in the county.

3.2 DESCRIPTION OF THE PROPOSED ACTION

This section provides a detailed description of the proposed action, including an overview of the Dairy Digester process. The components of an anaerobic digester, the expected byproducts, and the characteristics of those byproducts are provided.

3.2.1 Overview

This project would involve a plug flow anaerobic digestion facility designed to process manure from 2,000 mature Holsteins from the local Tillamook Bay area. A POTB-owned truck would collect 35-40,000 gallons per day of manure. The digester would annually generate 2.6 million kilowatt-hours of power, 13,000 MMBtu of hot water per year, and 38,000 cubic yards of fiber [RCM and Mattocks, 4/18/01].

Three components would make up the POTB digestion system: 1) manure treatment and digestion, 2) treated manure solids separation, and 3) biogas utilization. Two manure digesters, one manure influent tank, one digester effluent tank, one solids separation room, one separated-liquid storage tank, one biogas energy conversion room, and a separated-fiber holding area would be built on an existing seven-and-one-half acre concrete slab in the industrial park. All new structures would be built above ground, insulated, and roofed. The facility would be ready for use in 2002.

Plug flow digesters are rectangular tanks that contain no moving parts and require little maintenance. This type of digester is fed 11-13% solids ruminant manure. No waste of human origin would be received or processed at this facility. The digester functions by displacement of older material through the tank by new material. The digester is heated to about 100°F by heat exchanger to optimize bacterial growth and biogas production. Biogas (approximately 60% methane and 40% carbon dioxide) produced by the digester is collected in an inflatable cover over the digester. Heat for digester temperature maintenance is recovered from a boiler or an engine-generator coolant system.

In order to obtain the proper quality and quantity of manure, the POTB has been talking with local dairymen. The designers prefer free-stall barn manure from a 12-month confinement operation (no pasture time). Most of the dairy farms already have the right consistency of manure, but additional storage/process equipment would be purchased, e.g., an interceptor system that “intercepts” the water flowing into the manure collection tanks [Interview 9]. The on-farm procedures for manure collection and wash down are already in place.

Manure would be scraped into collection channels at least once daily. Parlor and wash waters would bypass the manure collection system except as necessary to maintain the pumped manure at about 11-13% dry matter. All precipitation and liquids from the washdown in the milk parlor would be diverted from the participating farm's manure collection system into their storage tanks.

On a scheduled basis, the POTB truck would pick up manure collected in tanks at participating farms. This raw manure would be deposited into a covered collection tank or mix pit at the digestion site and pumped into the two airtight digesters. This process would be repeated with the same farm until the desired levels were reached. In this manner, the truck would only transport manure to and from one farm at a time. This would allay some concerns relating to bio-security (see Section 4.7, Safety and Health: Humans and Cattle).

After about 20 days, treated effluent from the digester would be held in a covered tank for further processing in a screw press solids separator. Recovered fiber would be collected in a paved area adjacent to the digester. A full 30 days of fiber storage would be available next to the digester. Separated liquid would flow into a covered tank. The tanker truck would pick up a load of treated, separated liquid or nutrient-rich liquid for transport to one of the participating dairies for storage and/or land application. When the digester is fully operational, nutrient-rich liquids would be brought back to the same dairy where raw manure would be retrieved. The only liquid storage on-site would be to support the digester operation. Figure 1 illustrates the digester process.

Biogas from the digesters would be used to fuel two specially adapted engines coupled to generators. Power from the generators would be used at the digestion facility, but 90% or more would be sold to the local utility or used at POTB distribution level on-site [Interviews 7 and 9]. This system would have switchgears to protect the generators so they could interface with the PUD system. A step-up transformer would be needed to transform the output from the generators onto the local utility's 24.9 kVA distribution grid. The transformer and switchgear would be located on the same pad mount transformer [Interview 9].

Digester Components and Construction

Two digesters would be constructed approximately in the middle of an existing concrete pad between four towers of a burned blimp hangar (Figure 2). Seven core samples were taken of the 5-inch thick concrete floor to confirm that it is impervious, and would prevent waste from seeping through to the underlying soil. A structural engineering firm, Norton and Schmidt, would determine the depth of the steel foundation needed to secure the digester and the extent of the subsurface preparation and finished grading. The rock at this site would not require blasting or extraordinary equipment [Interview 10]. To smooth out the concrete and strengthen the foundation, another layer of concrete would be poured over the existing concrete pad.

Structural strategies for preventing spills and runoff would include an estimated 8-inch curb around the entire perimeter of the project site, including inside the roofline of the proposed compost area. The curb would have to comply with the solid waste permit, if that would be required for the digester and/or the compost facility (see Section 5.0, Regulatory Compliance Issues.)

Adjacent to the pull-through area for the truck, an underground sump pump would be installed and graded to collect any potential spills or drippings. All drippings and/or spills would be fed into the

influent tank of the digester. An operations manager would be responsible for mitigating runoff during the transfer of the manure and liquid nutrient [Interview 10].

The two digesters would be immediately adjacent to one another and share a long wall. The digestion and manure-processing portion of the system would consist of:

1. One manure collection tank, covered, with two days holding capacity, about 78,000 gallon (30' X 30' X 12')
2. Two concrete rectangular digester tanks with internal heating and insulation, a flexible impervious top, sized for 20-day manure retention (approx 140' X 30' X 12') and heated with waste heat (95-100°F)
3. One concrete rectangular effluent storage tank, sized for four days retention (approx 27' X 60' X 12') and covered with a wooden deck

Specifications for the two plug flow digesters are:

Heated plug flow digesters to accommodate	2,000 Holstein cow units
Influent volume	5,210 ft^3/d
Tank volume	52,100 ft^3
Average gas flow/day	160,000 ft^3 biogas

Biogas Utilization Components and Power Generation

Biogas produced in the digester would be combusted for production of electricity and hot water. All cogeneration equipment would be located immediately adjacent to the digester and associated tanks. The generators would be expected to run at about 90 percent of their capacity.

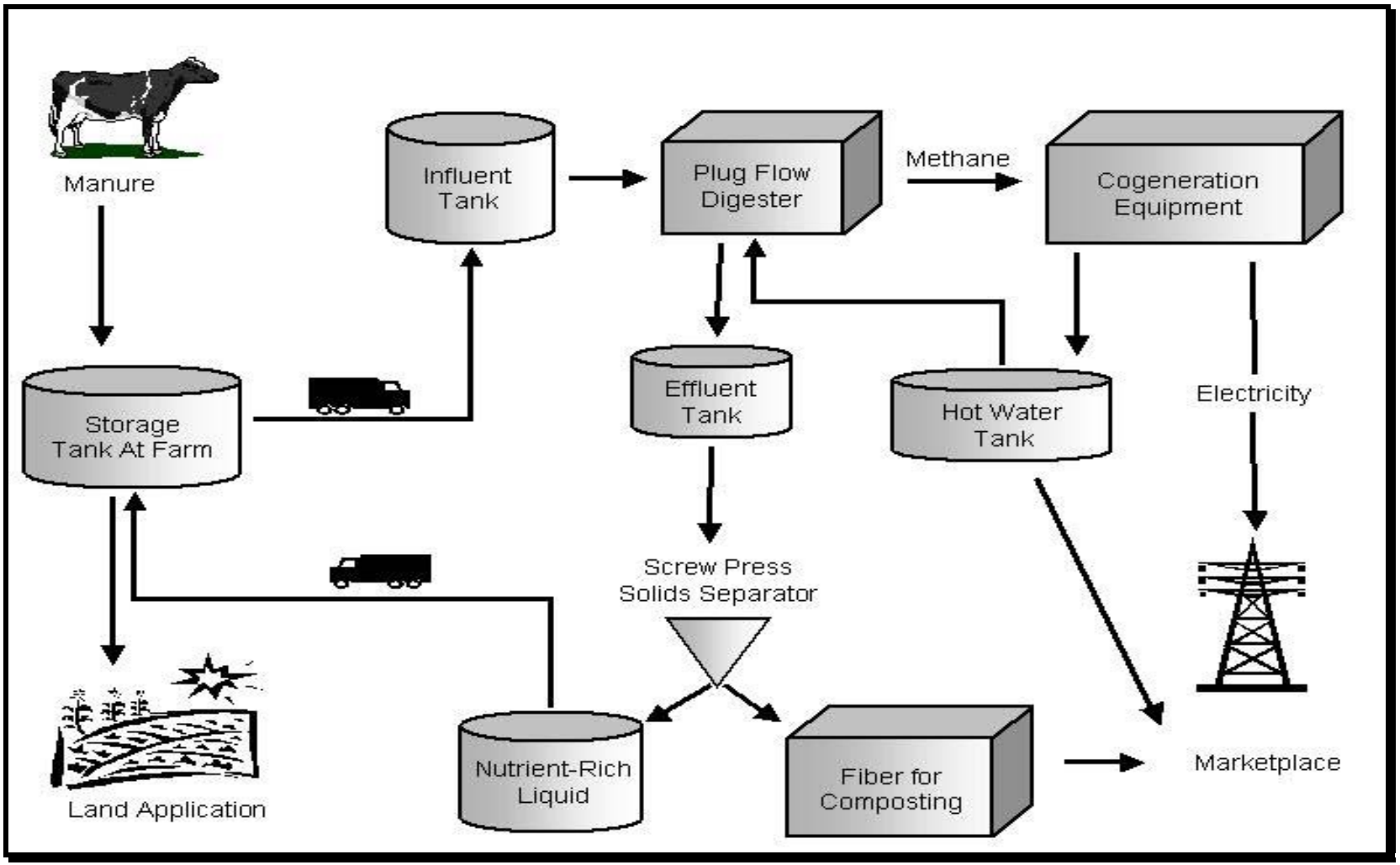
The energy or "biogas" utilization system would consist of:

1. One ventilated engine generator room, 30' X 40' X 12', with standard wiring and plumbing
2. Two engine-generator systems: engines appropriate for medium Btu biogas only, each with a 200 kW induction generator, with coolant jacket and exhaust heat recovery
3. One covered area housing a 6,000-gallon hot water storage tank (30' X 30' X 12')

Engine-generator building contents of the two turbo-charged units, rated at 200 kW each (for biogas only) would be comprised of the following:

1. One Electrical Service Center
2. One Utility intertie panel
3. One gas pressurization unit
4. One hot water circulating system

Figure 1. Conceptual Flow Diagram of the POTB Dairy Digester



[Adapted from RCM]

Figure 2. Aerial View of the 7.5-Acre Concrete Pad for the POTB Dairy Digester Site

Power used by the digestion system would be supplied by the biogas generation system. A backup service from the local utility would be in place.

During the start up period, propane or natural gas would be used to power the engines for heat. This phase would run approximately 2-3 months before the system would become self-sustaining. Filling the digester could take 3-6 weeks plus an additional month before becoming fully operational [Interview 9].

Hot water would be pumped into a 6,000-gallon storage tank. Water in the tank would be at 160-180°F. Biogas lines and insulated hot water pipes would be routed through a protected pipe chase between the digester and the co-generation room. Hot water would be available for sale to an as-of-yet-undefined user. About 25 to 35 percent of this water would be utilized within the digester system because a consistent source of hot water would be needed to maintain the digester temperature between 95-105°F [Interview 9].

Solids Separation Components and Fiber Sales

A byproduct of the digester process is fiber. Fiber recovery is very desirable because of the economic and environmental benefits. POTB is currently working on developing a relationship with a soil manufacturer (Pro-Gro) that would recover fiber and sell it for use in potting soil. The compost company has yet to determine if they would truck the fiber off-site to a processing facility in the

region or compost it on-site. It is highly likely that this composting firm would arrange to utilize this potentially valuable byproduct [Andrews, 5/15/01 and Interviews 1 and 5].

Two screw press solids separators would be placed in an enclosed structure built above and to one side of the effluent storage tank. Solids would fall into either a trailer or dump truck and then be hauled to the adjacent roofed concrete pad, where the composting process would begin. Pathogen tests would be run on the materials, and if proven safe they would go to a curing process. If pathogens were detected, Pro-Gro would implement a composting process at 132°F for a minimum of 4 days. Once the materials were proven pathogen-free, the curing process would begin. The curing process would allow the solids to cool down to less than 100°F so that proper aerobic organisms would be present. The curing process is a proven method of treating the solids by a number of mechanical "turnings" of the piles performed by a front-end loader tractor (depending on the volume) over a minimum of two weeks. No liquids will be used in this process. The materials would be hauled in one trailer truck about every two days. Because Pro-Gro hauls yard debris to the Tillamook region regularly, these trucks would already be in the proposed project area. Provided the project were approved, these trucks would back-haul the bulk-processed materials to the Pro-Gro location in Sherwood about one hour away. A solid waste permit is already in place for the composting and/or curing process [Interview 3].

The components of the solids separation portion of this project would be:

1. One separated-liquid nutrient holding tank, covered, with more than two days' holding capacity (30' X 30' X 12')
2. One solids separation room, (20' X 20' X 8'), above and to the side of the effluent tank
3. One fiber storage pad, (30' X 150') with roof trusses 15' above the pad (available to store 30 days of material)

Reception Room

To the east of the engine room and sharing a wall would be a room to receive visitors. The POTB envisions this project as an educational site where the workings of an anaerobic digester would be of interest to other local farmers, students, and government and non-governmental representatives. This room would be 30' X 30' X 14', well lit and ventilated. It would also store the 6,000-gallon hot water tank. There would be an elevated walkway looking through the window into the engine room.

Nutrient-rich Liquid and Fiber Characteristics

The expected characteristics of the nutrient-rich liquid and the fiber are based on the experience of the technical consultants, RCM, and some additional published sources [RCM and U.S. EPA 7/97]. The quality of the liquid would depend in large part on the types of feed and handling practices that would be implemented by the farmers. RCM would work with the participating farmers to specify these "inputs" so as to ensure byproducts would be of the highest value possible. In addition, the uncertainties of the liquid and fiber characteristics have triggered some issues with regulatory compliance (see Section 5.0, Regulatory Compliance Issues) and the utility of the byproducts for the marketplace. General characteristics are provided in Table 1.

Table 1. Quantities and Characteristics of Nutrient-Rich Liquid and Fiber*		
	Fiber - lb./CY	**Liquid - lb./1000 gal**
Nitrogen	4.5-6.0	30-40
Ammonia	2-3	15-20
Phosphorus pentoxide	2-3.5	10-15
Potassium Oxide	2-3.5	20-30
Sulfur	0.5-1.5	2-4
Magnesium	1-2	5-8
Calcium	3-4.5	7-10
Total Solids	20% - 30%	4.5%-5.5%
pH	7.8-8.5	7.5-8.2
Density	800-1,000 lb./CY	8.5-8.6 lb./gal.
Viscosity	"moist peat moss"	"chocolate milk"

* These estimated ranges are based on other dairy digesters similar to those planned for the project. Values are not exact, actual values may vary significantly [RCM].

The characteristics of the raw and separated manure are provided in Table 2.

Table 2. Nutrient Composition of Dairy Manure				
Manure Type	**Total N Nitrogen**	**Ammonium Nitrogen**	**Total P_2O_3 Phosphorus**	**Total K_2O Potassium**
Dry Stack (lb/ton wet manure)	10	3	10	15
Separated Solids (lb/ton wet solids)	5		2	2
Reception tank (lb/1,000 gallons)	20	8	7	18
Storage pond (lb/acre-inch)	135	109	30	135

Reference: Oregon State University

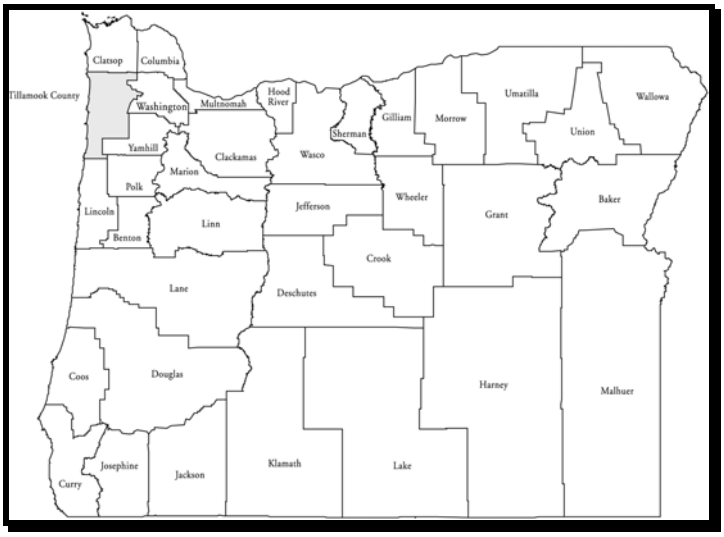
3.3 DESCRIPTION OF THE PROJECT LOCATION

This section discusses the Tillamook County area to provide an overview of the location and the region of influence of the environmental impacts. A brief description of the project site at the POTB along with a photograph and a topographical map follows the Tillamook County discussion.

3.3.1 Project Area: Tillamook County

Tillamook County is located on the Oregon Coast in the northwest corner of the state (Figure 3). With a 1997 population of 23,800 the county ranks 22nd among the state's 36 counties and accounts for approximately 1% of the state's total population. The county is comprised of 1125 square miles, a large portion of which is in state-owned forestland. Dairy farms in the coastal valley bottomlands provide milk for world-famous Tillamook cheese. The TCCA is one the primary industries of the county.

Figure 3. Oregon County Map



The Tillamook County economy is becoming less dependent on natural resource extraction and more economically diverse. Because the county is less than a hundred highway miles from the Portland metropolitan area, it is an increasingly popular location for Portland area residents to develop recreation and retirement homes.

The natural environment is perhaps the most significant factor shaping life in Tillamook County. Abundant natural resources were what first drew settlers here, and they continue to play a large role in supporting the economy and providing a high quality of life. Farming, forestry, and fishing are the traditional mainstays of the county's livelihood, and each currently faces challenges.

A large portion of the county is covered by forestlands owned by state and Federal agencies and private companies. Historically these lands have provided many jobs in logging and wood processing. Over the past several decades, harvests have decreased, yet recent increases in timber processing have helped alleviate declines in logging jobs. The "Tillamook Burn," a series of fires in 1933–1951, had a major impact on the ecology of the area. It not only affected the amount of harvestable timber for decades thereafter, but also caused significant amounts of erosion into rivers and bays [U.S. EPA, 12/99]. Most of the burned area is now held as a State Forestry Trust for the county. Regeneration of these stands is expected to significantly influence the rate of harvest and employment over the next 25 years.

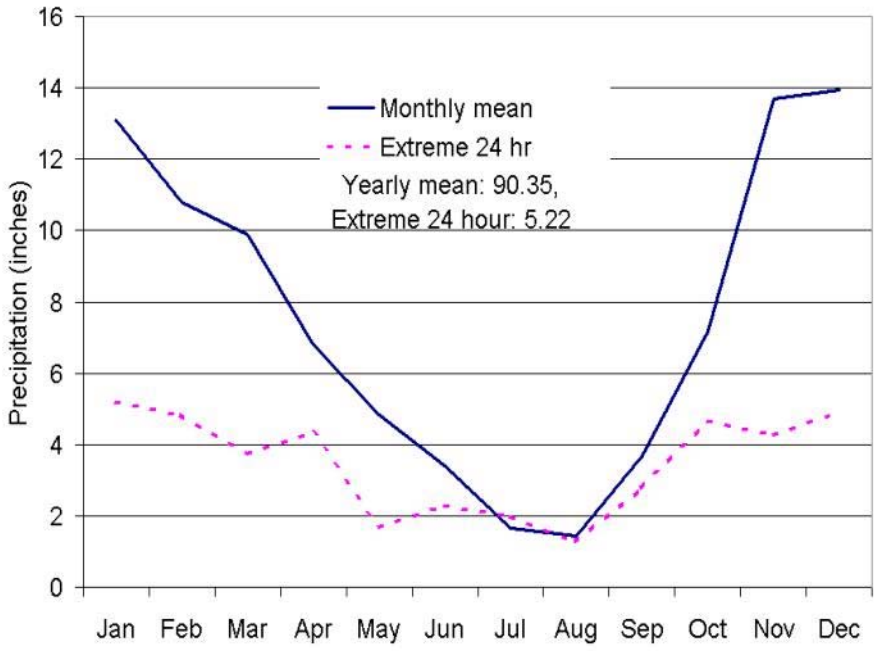
Agriculture in the county is dominated by the dairy industry. Although there has been an increase in the number of cattle over the last several decades, there has also been a decrease in the number of farms and land area used for farming. Despite these changes, the dairy industry continues to contribute significantly to the local economy and to shape the rural landscape that residents enjoy.

Water quality is a common thread for each of these traditional industries. Timber harvesting can impact riparian zones and sediment delivery to streams, agriculture can contribute excess nutrients and bacteria, and in turn the fishing industry can be negatively affected by each of these. Bacterial contamination and sedimentation are the most notorious water quality problems in county rivers and bays. Potential sources of bacteria include livestock, sewage treatment facilities, and septic systems [U.S. EPA, 12/99]. Sources of sediment include natural erosion processes, overland runoff from the Tillamook Burn, road and culvert washouts, and the channelization of streams and rivers preventing high waters from spreading out over the flood plain. Other water quality concerns in certain parts of the County are in-stream temperatures, habitat modification, and flow modification [Oregon DEQ, 1/01]. The Tillamook, Trask, Wilson, Kilchis, and Miami rivers all pass through or near the town as

part of a network of more than 20 rivers and streams that feed into Tillamook Bay and out to the Pacific Ocean six miles away.

Tillamook County experiences the mild, moist marine climate that prevails in the region of Oregon bordered on the west by the Pacific Ocean and on the east by the coastal Cascade Mountain ranges along the entire length of the state. On the coastal mountain range, the average annual rainfall in certain areas can be above 120 inches, whereas in the far eastern section of the state 6-8 inches of annual rainfall is normal. Tillamook County experiences significant precipitation (over 80 inches a year), most of which falls as rain in the winter months from November to March. Monthly mean and extreme 24-hour precipitation for the Oregon coastal area are shown in Figure 4.

Figure 4. Mean Precipitation in Tillamook, Oregon from 1971-2000 (preliminary)



Source: Oregon Climate Service

3.3.2 Project Site

The site for the potential digester is at the POTB Industrial Park, a former U.S. Naval Air Base and home to one of the blimp squadrons that patrolled the Pacific coast during World War II. The POTB is an Oregon Municipal Corporation formed as a Special District under Oregon Revised Statutes (ORS) 777.

POTB is approximately two miles south of the city of Tillamook on U.S. Highway 101, the major coastal link between Washington and California. POTB owns 1,600 acres of industrial property and is the largest fully industrial park on the Oregon Coast, with over 70 tenants and 400 employees. Several of the larger tenants include the Tillamook Air Museum, a public airport with two runaways, and various state and county facilities including a prison, sawmills, and other commercial facilities. POTB has about 600 acres of land that is leased primarily for dairy farming and/or grass production. Approximately 300 acres of the industrial park has been absorbed for industrial uses. Supporting that industry is the POTB-owned and operated 88.3-mile railroad, which also serves the coastal towns of Garibaldi, Rockaway Beach, and Wheeler.

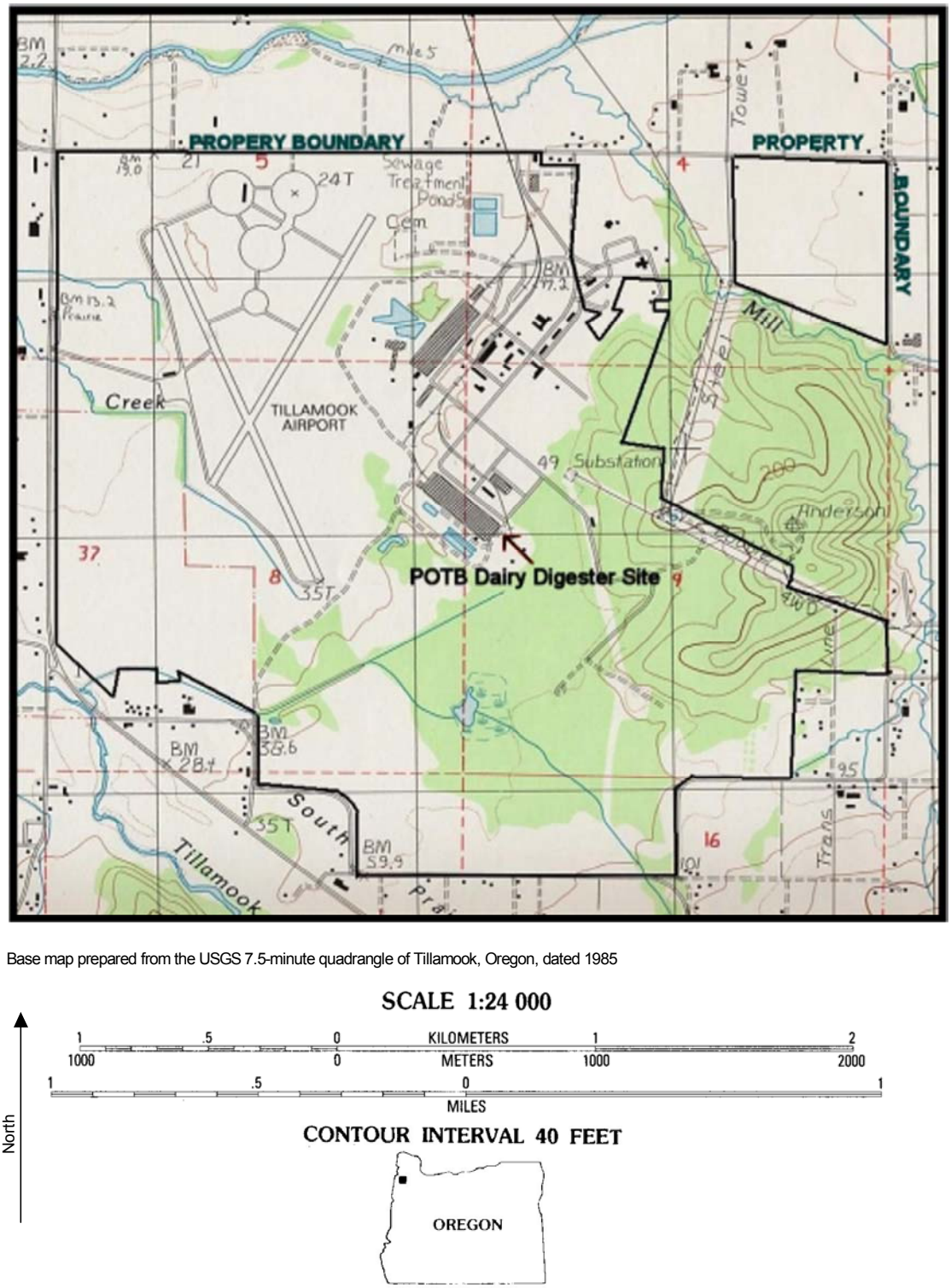
Figure 5. Concrete Pad Proposed to Serve as the Foundation for the POTB Dairy Digester & Compost Facility (Southeast Direction)

The proposed project site, located east of the intersection of Blimp Boulevard and A Street, would be a 7.5-acre concrete slab (Figure 5), referred to as Hangar Pad "A." The digesters would be built on about four acres of this area, including fencing around the perimeter (Figure 6).

The two digesters would be constructed on a five-inch thick concrete slab that would be reinforced with another layer of concrete. The slab is surrounded on two sides with asphalt roads, to the west by a dirt road, and to the south by open space.

The Tillamook PUD, the local utility, is a publicly owned, privately operated utility. It operates a 24,940 volt phased distribution system with a peak load of 120 MW and an average load of 50 MW. On average, the utility sells 33 million kW hours per month. On POTB property is a Bonneville Power Administration (BPA) substation, as BPA is the main supplier of hydroelectric power to this area. These substation distribution lines and other 3-phase distribution lines are within 1,000 feet and 300 feet from the proposed digester, respectively. The electricity generation by the digesters would be connected to the POTB distribution lines on-site without the need to connect to the substation [Interviews 5 and 7]. Though kilowatt prices will be increasing by about 40 percent this year, the overall prices in this area are still substantially lower than in other Western states [Interview 7].

Figure 6. POTB Diary Digester Project Location



Base map prepared from the USGS 7.5-minute quadrangle of Tillamook, Oregon, dated 1985

SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 METERS 1000 2000

1 .5 0 1

MILES

CONTOUR INTERVAL 40 FEET

North

3.4 THE NO ACTION ALTERNATIVE

Under the No Action Alternative, DOE would not authorize the funding for construction of the POTB Dairy Digester. As a result, it is unlikely this technology would be demonstrated in this area as a viable green power generation option and environmentally sustainable strategy for dairy farms. The existing techniques and procedures for manure management on individual farms would continue, including direct land application of raw manure.

3.5 ALTERNATIVES TO THE PROPOSED ACTION

There were no alternative approaches identified for processing manure other than an anaerobic digester. No other design was feasible for a centralized digester in Tillamook.

3.6 COMPARISON OF THE ALTERNATIVES AND ANTICIPATED CONTROL STRATEGIES

This section presents a snapshot of the potential environmental impacts from the construction and operation of the Dairy Digester Project as compared to the No Action Alternative. Table 2 presents a comparative summary of the impacts of the alternatives for each resource area, based on the evaluations contained in Section 4.0 of this report. In addition, strategies for controlling any potential environmental impacts are presented.

Anticipated Control Strategies

The Dairy Digester would include structural designs for preventing spills and runoff of any materials handled and transported. An estimated 8-inch curb around the entire perimeter of the project site, including inside the roofline of the proposed compost area, would be erected. Adjacent to the pull-through area for the diesel truck, an underground sump pump would be installed, and the area would be graded to collect any potential spills or drippings. All drippings and/or spills would be fed into the influent tank of the digester. The operations manager would be responsible for controlling runoff during transfer of the manure and liquid nutrient [Interview 10]. To ensure this practice is enforced, the POTB staff responsible for the operation and transportation duties would receive training from RCM technical consultants.

Two of the key potential environmental impacts evaluated in Section 4.0 are potential runoff from processed manure applications and the potential level of pathogens in the raw manure and nutrient-rich liquid. Each farm's CAFO permit regulates water quality and sets limits on the amount and the timing of manure applications. Quantitative assessments from testing, however, are usually not conducted unless the inspector observes any egregious signs of runoff [Interview 12]. The only method for tracking the characteristics of the manure and its potential runoff, after the construction of the POTB Dairy Digester, would be by a new testing and sampling program. The regulatory requirements that may be implemented for testing are unknown at this time (see Section 5.0, Regulatory Compliance Issues). According to the POTB management, a testing program with Oregon State University would be designed and implemented for both the transported raw manure and the nutrient rich liquid [Interview 5]. This periodic testing would be a very important factor for understanding the potential environmental impacts from applying nutrient-rich liquid as well as any concerns with bio-security. Bio-security is a practice designed to prevent the spread of disease onto a farm. It is accomplished by maintaining the facility in such a way that there is minimal traffic of biological organisms (viruses, bacteria, rodents, etc.) across its borders. Bio-security is the cheapest, most effective means of disease control available. No disease prevention program will work without it.

Table 3. Comparative Summary of the Potential Impacts of the Alternatives

Resource	No Action	Construction	Operation
Air Quality and Odor	No change from existing conditions	Construction dust and vehicle emissions – no degradation of air quality expected	Annual emissions, estimated to be 14.8 tpy NO_x, 9.75 tpy CO, 9.51 tpy SO_2, and 0.001 tpy PM_{10} , would be small and significantly lower than the NSR thresholds specified in the CAA. There would be a very slight potential qualitative benefit from fewer odors because all manure processing would be enclosed and there would be less land application of raw manure, reducing methane emissions, a greenhouse gas.
Water Quality	No change from existing conditions; Continued land application of raw manure, however, would exacerbate existing water quality concerns of nutrients and bacteria.	No change from existing conditions	There would be a potential qualitative benefit from the reduction of pathogens in the processed manure applications on participating farms. The beneficial impacts would be greater if the location of the participating farms would be in the same lower watershed area. The reduction of pathogens from land application of the nutrient-rich liquid would ease some concerns about recreational water uses and the presence of bacteria in the rivers and streams.
Wastewater	No change from existing conditions	No wastewater discharge	No substantive change. Wastewater requiring treatment would be less than 10% of the current on-site treatment system load.
Aesthetics & Land Use	No change from existing conditions	No change	Dairy Digester location is zoned for industrial use. No change expected from the No Action alternative.
Traffic & Transportation	No change from existing conditions	Over a 6-month period, there would be a small increase of traffic from workers, materials delivery, and construction vehicles. No measurable impacts expected.	An addition of 10 truck shipments per day, accounting for about 4% of the existing traffic patterns in and around the POTB, would be expected.
Socioeconomic Resources	No change from existing conditions	The peak construction workforce of between 10-15 persons for up to six months would not create any measurable impacts on the local workforce or the population.	Current POTB staff would support the operations. No change from the No Action alternative.
Safety & Health: Humans and Cattle	No change from existing conditions.	Hazards to workers would be typically experienced for routine construction projects. No expected impacts.	For the workers, there would be no measurable change from the No Action alternative. For the health and safety of the cattle, periodic testing of the manure and the processed liquid nutrient would allay any fears of potential disease traveling between farms.
Floodplains & Wetland	No floodplain involvement	No floodplain involvement	No floodplain involvement
Flora & Fauna		No effects on any Federal or State protected species	No effects on any Federal or State protected species
Cultural Resources		No effects on historic properties or archaeological sites	No effects on historic properties or archaeological sites
Soils & Geology	No change from existing conditions	No change from the No Action alternative	No change from the No Action alternative
Noise	No change from existing conditions	Maximum noise level of 71 dBA at nearest residence for short durations. No appreciable change is expected.	No appreciable change from the No Action alternative

4.0 AFFECTED ENVIRONMENT AND THE ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

4.1 AIR QUALITY AND ODOR

This section provides an overview of the regulations governing air quality as well as the potential environmental impacts from construction and operation of the proposed action. A discussion of the odor impacts associated with the existing environment is included. A brief overview of the implications of reducing methane, a greenhouse gas, is provided in the last subsection.

4.1.1 Affected Environment

The Clean Air Act (CAA) of 1990 provides the principal framework for national, state, and local efforts to protect air quality. Under the CAA, the U.S. Environmental Protection Agency (EPA) has set standards, also known as National Ambient Air Quality Standards (NAAQS). National primary ambient air quality standards define levels of air quality, with an adequate margin of safety, to protect the public health. National secondary ambient air quality standards define levels of air quality judged necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. NAAQS are shown in Table 3. The EPA is also responsible for ensuring that these air quality standards are met, or attained (in cooperation with state, tribal, and local governments) through national strategies to control pollutant emissions from automobiles, factories, and other sources. As delegated by EPA, the State of Oregon DEQ Air Quality Division is responsible for protecting Oregon's air quality. DEQ monitors air quality to ensure that the whole state meets and maintains national air quality health standards. Oregon Air Quality regulations are found in Chapter 468A of the ORS. The proposed site for the Digester Facility at POTB at Tillamook County is within an air quality attainment area for all six of the NAAQS criteria pollutants: carbon monoxide, ozone, lead, nitrogen dioxide, particulate matter, and sulfur dioxide.

Section 176 (c)(1) of the CAA requires Federal agencies (here, the U.S. Department of Energy, which is funding this project) to assure that their actions conform with applicable implementation plans (in most cases the State implementation plan) for achieving and maintaining the National Ambient Air Quality Standards for the criteria pollutants: ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, lead, and PM_{10} (particulate matter with an aerodynamic diameter less than or equal to 10 microns). In 1993, the Environmental Protection Agency issued general conformity regulations (40 CFR Part 93, Subpart B) that included procedures and criteria for determining whether a proposed Federal action would conform to State implementation plans. In the first phase, a conformity review is undertaken to establish whether conformity regulations would apply to a proposed action and alternatives. If such a review determines the proposed action or alternatives is in an attainment area, the action or alternative would be exempt from conformity requirements. The POTB site associated with the proposed alternatives lies within an attainment area for all criteria pollutants. Hence no further reviews of the proposed alternatives are required from the perspective of the CAA general conformity requirements.

The nose and the brain work together to create what we perceive as odor. Our sense of smell is activated when the nose captures odor-causing chemicals, called odorants, from the air. Nerves located in the nose pass a message onto the brain when they detect an odorant. For example, the brain notices that there is a general odor at a detection level of around 17 parts per billion (ppb) of

ammonia in air. At a higher recognition level the brain begins to recognize an odorant as a distinct scent, and, again using ammonia as an example, the average human recognizes a scent to be ammonia when the concentration reaches around 37,000 ppb. The strongest odor from dairy operations is generated when stored liquid manure is agitated and spread. The strongest and most pungent odors from decaying manure arise from the released ammonia or sulfurous gases. Precise documentation of the strength and nature of an odor is generally unavailable because of the large number of odorants involved and their effects on each other. Regulation of air pollution odors occurs indirectly through the Nuisance Law, which is based on the right of all landowners to be free from unreasonable interference to enjoy their property.

4.1.2 Environmental Consequences

Construction Impacts

Construction of the proposed Dairy Digester would produce short-term, low-level, intermittent, and transient emissions of NO_X, PM_{10}, and CO from the trucks and the operation of construction machinery. Due to the small and temporary increase in traffic that would be needed for facility construction, which would be completed within 3-6 months, no appreciable effects on ambient air pollution concentrations from vehicle emissions would be expected. In addition, dust potential created by construction activities would be controlled by conventional water spraying techniques. Construction impacts would not be expected to produce any degradation of ambient air quality.

Operation Impacts

Major stationary sources of air pollution and major modifications to major stationary sources are regulated under Title V of the CAA, which requires obtaining an air pollution permit before commencing construction. The process is called New Source Review (NSR) and is required whether the major source or modification is planned for an area where the NAAQS are exceeded (nonattainment areas) or an area where air quality is acceptable (attainment and unclassifiable areas). A new source is major if it has the potential to emit any pollutant regulated under the Act in amounts equal to or exceeding specified major source thresholds (100 or 250 tpy), which are predicated on the source's industrial category. As described in full detail below and shown in Table 4, the estimated air pollutant emissions for the proposed project lie very substantially below these triggering limits. The proposed project would not be a major new source, and permitting would not be required under the Oregon Title V Operating Permit program administered by the Oregon DEQ. However, some sources that are non-major may be regulated under the DEQ Air Contaminant Discharge Permit (ACDP) program pursuant to the related statutes for stationary sources found in the ORS 468A.040 through 468A.060.

Air Contaminant Discharge Permits are primarily issued to regulate non-major sources of air emissions where emissions contain more than 5 tpy of particulate (PM_{10}) or more than 10 tpy of any one gaseous pollutant but less than 100 tpy of any regulated pollutant, or 10 tpy of a single hazardous air pollutant, or 25 tpy of combined hazardous air pollutants. Because estimates predict more than 10 tpy of NO_x emissions from the project, an ACDP has been requested from Oregon DEQ [Crider, 5/2/01].

Table 4. National Ambient Air Quality Standards (NAAQS)

Criteria Pollutant	NAAQS	Averaging Time	Concentration
Sulfur oxides[a] (Sulfur dioxide, SO_2)	Primary	24-hour[b] Annual arithmetic mean[c]	365 µg/m^3 (0.14 ppm) 80 µg/m^3 (0.03 ppm)
	Secondary	3-hour[b]	1,300 µg/m^3 (0.5 ppm)
Particulate matter, PM_{10} [d,e]	Primary & secondary	24-hour[b] Annual arithmetic mean[f]	150 µg/m^3 50 µg/m^3
Carbon monoxide, CO	Primary only	8-hour[b] 1-hour[b]	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)
Ozone[e], O_3	Primary & secondary	1-hour[g]	0.12 ppm (235 µg/m^3)
Nitrogen dioxide, NO_2	Primary & secondary	Annual arithmetic mean[c]	0.053 ppm (100 µg/m^3)
Lead, Pb	Primary & secondary	Calendar quarter[c]	1.5 µg/m^3

[a] Measured as sulfur dioxide.

[b] Not to be exceeded more than once a year.

[c] Never to be exceeded.

[d] Particles with an aerodynamic diameter less than or equal to 10 microns (µm).

[e] On July 18, 1997, the EPA introduced a new NAAQS for ground-level ozone and for particulates (62 FR 38855 and 62 FR 38652, respectively). The EPA planned to phase out and replace the 1-hour 0.12 ppm ozone NAAQS with a new 8-hour 0.08 ppm standard more protective of public health. The EPA also planned to revise the NAAQS for particulate matter. The standard for particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}) was essentially unchanged. Two new standards were added for particulate matter less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$). These were set at 15 µg/m^3 annual arithmetic mean $PM_{2.5}$ concentration, and 65 µg/m^3 24-hour $PM_{2.5}$ concentration. However, in response to legal challenges, the U.S. Court of Appeals vacated the new particulate standard and directed the EPA to develop a new standard, meanwhile reverting back to maintaining the previous PM_{10} standards. The revised ozone standard was not nullified, but the court ruled that the standard 'cannot be enforced.' In July 2000, the EPA formally rescinded the 8-hour 0.08 ppm ozone standard and reinstated the 1-hour 0.12 ppm ozone standard in the approximately 3,000 counties where it had been replaced (65 FR 45182). In February 2001 the U.S. Supreme Court affirmed EPA's authority to establish health-based ambient air quality standards and affirmed that the Clean Air Act prohibits consideration of implementation costs when setting those standards. The Court, however, overturned EPA's procedures for implementing the standards and remanded the case back to the Appeals Court Level for resolution of those and certain other issues. Until EPA proposes implementation programs that the Court finds acceptable, implementation of the 8-hour ozone standard and the $PM_{2.5}$ standard are on hold. Therefore, it is uncertain at this time when new ozone and particulate matter enforceable standards will be in place, and as of now the 1-hour 0.12 ppm ozone, and 50 µg/m^3 annual and 150 µg/m^3 24-hour PM_{10} standards are the only ones enforceable.

[f] Standard is attained when the annual arithmetic mean is less than or equal to 50 µg/m^3.

[g] Not to be exceeded in any one day more than once a year.

Concentrations are as listed in 40 CFR Part 50. When equivalent values were so listed they are shown here within parentheses.

The most significant sources of air pollutant emissions from the proposed plug flow digester system would be from the combustion of 160,000 ft^3/d of methane-rich biogas produced during the anaerobic digestion process. The biogas would contain approximately 60% methane, have a fuel value of about 600 Btu/ft^3, and be burned "lean" in two naturally aspirated engine-generator systems (type CAT 3406 units) under a >90% load to generate 300 kW of 480 kV 3 phase, 60 Hz electricity [RCM and Interview 9].

Table 5. Estimated Emissions from the Proposed POTB Dairy Digester

Air Pollutant	Emission factor (AP-42, lb/MMBtu fuel input)[1]	Total Emissions tpy
NO_X	0.847 [1]	14.8
CO	0.557 [1]	9.75
PM_{10}	0.0000771 [1]	0.001
SO_2	0.000588 [1] Stoichiometric oxidation of H_2S [2]	0.01 9.5

[Crider, 5/2/01]

[1] The Compilation of Air Pollutant Emission Factors, AP-42, Volume 1, 5th Edition, (commonly known as "AP-42") *Stationary Point and Area Sources*, published by the EPA, contains emission factor information on more than 200 stationary source categories. AP-42 emission factor data for natural gas fuel were used here to compile the emission totals for a Btu value for gas of 600 Btu per cubic foot.

[2] The biogas would contain between 200 and 2,000 ppm by volume of hydrogen sulfide (H_2S). The H_2S in the biogas would be stoichiometrically oxidized to sulfur dioxide (SO_2) when it is burned as fuel in the engines powering the electric generators. Assuming the maximum concentration of 2,000 ppm of H_2S, this translates to an annual production of 9.5 tons per year of SO_2.

As specified in the conditions listed in Plans and Specifications and Construction Approval Conditions, a letter issued on May 17, 2001 to POTB by DEQ, all processes and control equipment shall be operated to prevent emission of odorous matter and creation of a nuisance condition or conditions by the plant. In the event that a nuisance condition were verified by DEQ, process modifications and/or control equipment would be required. However, as described in Section 3.0, all manure, effluents, and filtrates would be sealed from outside air; thus, there would be no opportunity to vent any odors to the outside air. Manure would be delivered in a sealed tank on a truck and pumped through an air-sealed connection to a covered collection or mix pit and later pass though a sealed connection into the airtight digestion system (because the digester process is anaerobic, it would, by definition, be sealed from outside air). The treated effluents from the digester would be held in a covered tank for further processing in a screw press solids separator. Separated liquid would flow into a covered tank. These separated liquids would be later pumped through a sealed connection to the truck and returned to each dairy farm for storage and subsequent land application. According to RCM consultants, 90-95 percent of the odor from raw manure would be reduced by the digester process [Interview 9].

Biogas from the digestion system can contain up to 2,000 ppm of odorous H_2S (which has an odor recognition level of about 5 ppb), but would be completely stoichiometrically converted to SO_2 when burned in the two engines used to power electric generators, and hence would not have the opportunity to escape to outside air as odorous H_2S. Recovered fiber from the screw press solids separator would be collected in a roofed, paved area adjacent to the digester. This recovered fiber

would be stored under cover for upwards of 30 days to be sold for processing in composting soil. This recovered fiber would have a close-up faint ammonia smell, but would not generally be considered odorous. The temporarily stored recovered fiber would not be considered a noticeable odor source within the local industrial POTB site area, or to the surrounding rural region of operating dairy farms.

In conclusion, odor nuisance from the proposed project, or at the POTB digester system site, would not be a concern. Because digested treated effluents, rather than raw manure, would be applied to land within a 5-mile radius collection area, an overall odor reduction would be possible, albeit such a reduction may not be perceptible in this rural, dairy farm region.

4.1.3 Global Warming

An important global environmental issue is the possibility of major changes in climate ("global warming") as a consequence of increased concentrations of "greenhouse" gases, in particular carbon dioxide (CO_2). Although the impacts of "greenhouse" heating effects on global climate change are still uncertain, most scientists agree that emissions of greenhouse gases could adversely influence global climate change. It is generally agreed that fossil fuel burning is the primary contributor to increasing concentrations of the major anthropogenic greenhouse gas, carbon dioxide.

Methane and ammonia are the major pollutants from decomposing cow manure alongside pathogens, nitrogen nutrients, and increased biological demand. Methane has a global warming potential (GWP) of 21 times that of carbon dioxide over a 100-year lifespan, and is only second to carbon dioxide as an anthropogenic contributor to global warming. Methane is produced from the anaerobic decomposition of livestock manure. The major sources of U.S. livestock manure methane include dairy farms and other livestock operations that use liquid manure systems. However, approximately twice the amounts estimated from animal manure are produced during the enteric fermentation (digestion) in cows and other livestock. In the U.S. an estimated 5 million tons per year of methane are emitted directly into the atmosphere from livestock enteric fermentation. In addition, the production of the greenhouse gas nitrous oxide (N_2O) can result from the land application of livestock manure as well as direct excretion by animals onto soil. While N_2O emissions are much lower than CO_2 emissions, N_2O has a very high GWP of 310.

Methane emissions arising from the enteric fermentation in the population of 2,000 Holstein cows whose manure wastes would be used in this project, would, of course, remain unchanged. The digester system, however, emitting zero methane, would result in lower overall methane emissions compared to current practices of direct land application and open storage tanks, which allowed methane to vent freely into the atmosphere. Any methane emissions that would be displaced by the proposed project would be an equivalent 21-fold reduction of carbon dioxide in terms of global warming potential. Reflective of the above considerations, this project would provide a very small, but nevertheless real, reduction of greenhouse gases.

4.2 WATER QUALITY

The water quality section provides a general description of the watershed basin and the existing concerns from dairy farming. The potential benefits from the Dairy Digester are discussed qualitatively.

4.2.1 Affected Environment

The project site is located within the Tillamook Basin, which encompasses about 338,000 acres and drains the watersheds of five rivers: the Miami, Kilchis, Wilson, Trask, and Tillamook. The watershed consists of a winding network of river channels and 405 miles of tributary streams. Over the last 20 years, various government agencies, including the DEQ, sampled the five rivers in the Tillamook Bay Watershed and identified potential bacterial sources from livestock operations, wastewater treatment plants, and failing septic tanks.

Section 303 of the Clean Water Act (CWA) requires states to set water quality standards for protecting existing and beneficial uses for surface water bodies. Specifically, total maximum daily loads (TMDLs) provide strategies to reduce chemical, nutrient, and sediment loading and set daily limits on the amount and type of pollutants entering streams. In 2001, Oregon DEQ completed their TMDL study establishing maximum load allocations by land use for both bacteria and temperature [Oregon DEQ, 1/01]. The Oregon DEQ has listed all five streams/rivers entering Tillamook Bay as water quality limited for bacteria and stream temperatures.

Other state and Federal agencies are actively working with local farms to mitigate water pollution sources and invigorate the rivers and streams. For example, the Oregon DOA has completed (December 2000) a water quality management plan (SB1010) that will be used to implement the TMDL recommendations. The NRCS conservation plans developed to implement this project will assist farmers to meet the load allocations and prescribed conditions outlined in these plans [U.S. DOA, 6/01/01].

The Federal CWA provides the management framework for all local water quality policies and projects. The EPA has delegated authority for the National Pollution Discharge Elimination System (NPDES) permits for confined animals to the State of Oregon. The Oregon DOA has the permitting authority for CAFOs covered by the State Water Pollution Control Facilities Permit. All dairies in the watershed are required to have CAFO permits under this program.

The most important framework for water quality regulations relevant to this project relate to the CAFO permit that limits herd size and specifies quantities of land applications of manure. During the growing season, when the danger of runoff contamination is less, farmers may apply a specific amount of manure as fertilizer to their fields. Regulations restrict the application amount to avoid nutrient loading and fecal coliform contamination in local watersheds. Agronomic nutrient rates are central to water quality concerns in this area. Nutrient loading provides soil with nutrients such as nitrogen and phosphorus that crops need. However, if those same nutrients flow from farms into local streams, their growth enhancing benefits can become detrimental. Manure runoff can increase plant growth in streams and lakes by loading the water with excess nitrogen and phosphorus in a process called “nutrient loading.” As more plants decay in the water, they increasingly compete with fish for oxygen. The result leads to low levels of dissolved oxygen (DO) and a potential decrease in fish populations [Oregon DEQ 1/01]. Available data for Tillamook Bay does not indicate serious problems from nutrient loading. Dissolved oxygen concentrations meet water quality standards in most areas of the watershed. Nutrient concentrations do not appear to adversely impact water quality. No acute or chronic effects from toxic substances have been observed or monitored.

Federal and state water quality strategies began improving manure storage facilities and controlling runoff around livestock confinement areas. Despite these activities over the last 10 years, substantial

amounts of bacteria from livestock continue to enter Tillamook Bay and its tributaries, probably due to an increase in the total number of dairy cows in the watershed [U.S. EPA, 12/99]. Bacteria and other pathogens from both point and non-point sources present the principal water quality problem. Bacterial pollution threatens public health through the ingestion of contaminated shellfish (mostly oyster beds) and direct recreational water contact. Bacterial loads result in frequent closures of commercial shellfish harvesting areas -- about 90 to120 days per year [Oregon DEQ, 1/01 and Interview 2].

An Oregon State University study to identify the sources of bacteria in the Tillamook Bay watershed found livestock to be the source of about 40 percent of the bacteria samples [U.S. DOA, 6/01/01]. Approximately 70 percent of the annual agricultural bacteria loading is derived from commercial dairy operations. Lack of adequate storage to avoid spreading manure during the wet winter months is a common limitation of existing dairy facilities. Overall, the greatest reduction in bacterial loading occurs by ensuring livestock facilities are adequate to confine animals and collect and store wastes throughout the wettest months of the year (November 1 – April 1).

4.2.2 Environmental Consequences

Various Federal and state agencies are working to fund and implement water quality control programs. Two recent studies outline specific strategies for pollution control from dairy farms, including a dairy digester [U.S. DOA, 6/01/01 and U.S. EPA, 12/99]. An anaerobic digester system can reduce fecal coliform bacteria in manure by more than 99 percent, thus virtually eliminating a major source of water pollution [Oregon Office of Energy, 9/98 and Interview 9]. Separation of solids during the digester process removes about 25 percent of the excess nutrients from manure, and the solids (fiber) could be "exported" from the watershed basin to permanently reduce the nutrient load of the Tillamook area. This water quality benefit cannot be measured quantitatively; however, the consistency of the nutrient-rich liquid would create a more efficient uptake for the crops. In this way, the potential runoff to the watershed of nitrogen and phosphorus may be reduced, particularly in the growing season [Interview 11]. Some experts believe, on the other hand, that nitrogen and phosphorus would not be reduced with this process, though reduction of pathogens is a certain benefit [Interview 12]. The environmental benefits to soils and agronomic rates on dairy farms from processed manure are not well documented. Periodic testing of the nutrient-rich liquid from the digester would clarify this potential impact.

Though the location of the farms participating in this project have not been identified, if they are concentrated in the lower reaches of the watershed, and/or on the same river, the potential benefit would be more apparent [Interview 17]. Overall the reduction of fecal coliform organisms in the runoff from farms would be a benefit to the watershed [Interview 6].

4.3 WASTEWATER

4.3.1 Affected Environment

The POTB industrial park is fully serviced with 18-inch sewer mains and 48-inch storm sewers already installed. Each tenant has a septic tank with separate wastewater lines that are gravity pulled to the on-site wastewater treatment plant. The POTB has an above ground, permitted lagoon system that stores the water decanted off the septic system. The overflows are sent to two lagoons through underground PVC pipe. Since 1999, the Port has replaced all sewer lines with PVC pipes, installed a new step system, and repaired the lagoons. Overall sewage flow on the base is about 6,000 gallons

per day, which accounts for 1% of total capacity allowed by their wastewater permit (0.56 million gallons per day) [Interview 10].

4.3.2 Environmental Consequences

Construction Impacts

No wastewater would be generated from construction activities.

Operational Impacts

It has been estimated that the proposed project would generate about 5 gallons [Interview 10] of wastewater per day. This would be less than one percent of the current generation of wastewater at the POTB. The wastewater would come from the restroom facilities in the visitor center. For the project, new PVC connector pipes would be installed to connect to a new septic tank. This site already has 8- and 12-inch gravity lines as well as 23-inch step lines that would be more than adequate for the wastewater flows expected from operations.

4.4 AESTHETICS AND LAND USE

4.4.1 Affected Environment

The site of the proposed Dairy Digester would be within the POTB Industrial Park and is zoned for industrial use. Land use surrounding the site is for small industrial/commercial operations and buildings from the former Naval Air Station. POTB has a total of 600 acres of leased farms in the area that are primarily used for dairy farming and located within 1-2 miles of POTB property. The subject property borders are:

1. To the north, across A Street, the TCCA Feed Mill, a vacant parcel, an abandoned building, and Gayle's Art Enterprises
2. To the east, a lumber mill and the POTB-permitted wood waste landfill;
3. To the south, vacant property
4. To the west, a dirt road, equipment storage area, and Trask River Lumber company

There are no scenic vistas or aesthetic landscaping located in the immediate vicinity of the proposed project.

4.4.2 Environmental Consequences

No zoning permits would be needed, as the site is located within the 1,600 acres zoned for industrial use. The dirt access road leading up to the site would be paved [Interview 5]. The proposed project would have no measurable impacts on land use within the vicinity of the industrial site and would not interfere with visual resources.

4.5 TRAFFIC AND TRANSPORTATION

4.5.1 Affected Environment

The proposed project site would be located within the POTB industrial park at the end of a dirt access road. Less than 500 employee vehicles, visitor vehicles, deliver vehicles, and truck shipments drive through the industrial park each day [Interview 18]. The county services the roads.

4.5.2 Environmental Consequences

Existing roadways would be used to access the proposed Dairy Digester site. Construction worker commutes and equipment transportation would slightly increase traffic to the project site, but the increase would be small and for a short duration. The total work force during construction would be about 40-60 workers, and these workers would be phased in through the construction, beginning with the structural engineers and concrete workers. Since construction activities would be completed in less than six months, minimal impact on traffic patterns around the Dairy Digester site would be expected.

During operations, one 4,000-gallon capacity diesel truck would be required to haul manure and nutrient-rich liquid product to and from the Dairy Digester facility. It would make a maximum of 20 trips per day, with an average of 6–10 trips per day from individual farms back to the Dairy Digester. Six to seven farms would be expected to participate in this project, and they would be within a 5-mile radius from the POTB site [Interviews 5 and 10]. The impact of this traffic on the industrial site would be minor, as it would constitute less than 4% of all vehicular traffic on and around the POTB.

4.6 SOCIOECONOMIC RESOURCES

4.6.1 Affected Environment

In comparison with state and county averages, Tillamook County generally ranks lower on economic indicators. An exception is the county's unemployment rate (5.1%), which was not significantly different than the state average (4.8%). However, the per capita income level is substantially lower than the state level and somewhat lower than income levels in adjacent coastal counties. The City of Tillamook has a population of 4,000, with employment primarily associated with farming, lumber mills, manufacturing, and the local hospital.

4.6.2 Environmental Consequences

Construction Impacts

During construction of the Dairy Digester, multiple (6-8) contractors would be involved with about 40-60 construction personnel. The contractors would primarily come from the Tillamook County labor pool, including mechanics, steel workers, carpenters, plumbers, and structural engineers [Interview 9]. The peak workforce involved at any one time would be expected to be about 10-15. These construction personnel would be on site between 3-6 months depending on the weather. Given the small number of personnel on contract for less than six months, impacts on the local economy would be minimal.

Operational Impacts

Operation of the Dairy Digester would involve two existing employees—the trucker and the maintenance and operation staff. Current employees at the POTB would provide the operating labor. This would not impact the employment levels of the POTB or the immediate area.

Other socioeconomic impacts would involve the on-farm investment to accommodate the manure requirements of the digesters. As mentioned above in Section 3.2.1, some farms may have to install additional equipment such as interceptor system—intercepting the water flowing into the manure collection tanks. This equipment could cost several thousand dollars and may limit some farms from participating in the digester project.

4.7 SAFETY AND HEALTH: HUMANS AND CATTLE

4.7.1 Affected Environment

The affected health and safety environment pertains to workers and bio-security, the protection against transfer of disease, such as hoof and mouth disease. A plug flow digester requires minimal maintenance and does not present safety concerns for workers [Oregon Office of Energy, 9/98]. The POTB has an existing safety plan, and all workers are made aware of procedures through training.

The farming community in the U.S. now has heightened sensitivity to bio-security because of the recent incidences of hoof and mouth disease in Western Europe. There has been no evidence of this disease in the U.S. to date. A concern with this project is that "mixing" of manure from different farms could compromise the bio-security of the area. If one farm discovers the disease, the potential for dissemination is very high, even without the mixing of manure and/or cattle from one farm to the other. Transferring cows and manure, however, already occurs in this area in certain circumstances [Interview 13].

4.7.2 Environmental Consequences

Construction Impacts

Potential health impacts to workers during construction would be limited to normal hazards associated with routine construction. Given the relatively small size of the project (less than 4 acres), the risks would be comparable to a routine industrial project involving concrete, structural, and electrical work. All personnel involved with the digester construction would be properly trained in required Occupational Safety and Health Administration (OSHA) practices and industrial material handling. RCM, the digester experts associated with the POTB project, would be involved in recommending contractors. In addition, the POTB manages many of the maintenance projects at the industrial site and would have overall oversight of the construction activities. Following installation of the equipment, RCM would verify proper installation and design specifications.

Operation Impacts

Generally, plug flow digester operations are considered safe because there are very few moving parts. For the two workers involved, RCM would provide overall training on the digester operations. Health and safety practices for operation of the proposed facility would be integrated into the existing POTB safety program [Interview 5].

In addition, biogas, while comprised of 60% methane, does not contain the oxygen necessary for combustion. The inflated digester top would contain no oxygen. As with all manure management, confined spaces would be ventilated for safe entry, and, as with all internal combustion engines, certain operating norms would be maintained in the cogeneration system.

The plug flow Dairy Digester would combine manure from the participating farms in the digester's influent tank and return nutrient-rich liquid to the farms. According to RCM and published materials, anaerobic digester systems can reduce fecal coliform bacteria in manure by more than 99 percent, virtually eliminating a major bio-security risk [Interview 9 and Oregon Office of Energy, 9/98]. In order to further mitigate the risks of "mixing" raw manure in one tank, the POTB dairy digester operator would implement strict health and safety procedures. Pick-up of raw manure would only be from one farm at a time without mixing the loads in the truck. In one day, the truck would pick up raw manure from a single farm several times during that day until all the raw manure destined for the digester was transported. Thereafter, the truck, hoses, trucker's boots, and equipment would be hosed down before the next farm pick-up. This washdown water would be directed into the underground sump pump to be fed into the Dairy Digester. Therefore, bringing nutrient-rich liquid or the processed manure back to the farms from the digester would not be expected to present any additional risks to cows associated with bacterial disease.

4.8 FLOODPLAINS AND WETLANDS

4.8.1 Affected Environment

The project site would consist of the 7.5-acre foundation area of the former blimp hanger at the POTB Industrial Park. This site, about 50 feet above mean sea level and eight miles east of the Pacific Ocean coastline, is above the 100-year flood elevation [PBS Environmental, 6/00].

The project site is surrounded by small industrial and farming operations. In 1997, a comprehensive wetland determination study was prepared, and approximately 741 acres of wetlands were identified within a 4-mile radius of the POTB site. The survey of the area indicated that no wetlands currently exist at the site [POTB, 2/26/97]. Upland grasses and forbs have invaded areas surrounding the foundation that can support plant growth.

4.8.2 Environmental Consequences

Based on the 1997 wetlands delineation study, there are no documented wetlands in the project area; therefore, no effect on wetlands would result from the proposed project. The wetlands identified on and around the POTB are predominately found along the rivers. The closest river would be about one mile from the project site. In addition, all project facilities would be constructed on a concrete pad, which would eliminate the potential for impacting wetland habitat. However, if at any time during project performance evidence of wetlands would be found in any of the areas subject to impact, in terms of presence of hydrophytic vegetation, wetland hydrology, or hydric soils, the U.S. Army Corps of Engineers would be notified to determine the applicability of Section 404 authorization.

4.9 FLORA AND FAUNA

4.9.1 Affected Environment

The vast majority of land surrounding the proposed site is used for agricultural production and dairy farming. Douglas fir is the dominant tree species found in this area's coniferous forests, which cover about 89% of the Tillamook Bay land area.

4.9.2 Environmental Consequences

No adverse impacts to fish, plant, or wildlife species would be anticipated from construction or operation of the proposed project. Consultation with the U.S. Fish and Wildlife Service has confirmed that the proposed project would not affect any endangered or threatened species or their habitat (Appendix A*)*. In addition, an interview was conducted with the Oregon Department of Fish and Wildlife, which confirmed this assumption [Interview 8].

4.10 CULTURAL RESOURCES

4.10.1 Affected Environment

The POTB is located on a portion of the former WWII Naval Air Station. One of the blimp hangars was converted to an Air Museum several years ago and houses vintage airplanes, equipment, and photos. The second Blimp Hangar, where the Dairy Digester would be located, burned down in an accidental fire in 1997. This fire destroyed the entire structure except the support columns. No historical or cultural places or archaeological sites are located in the vicinity of the proposed project.

4.10.2 Environmental Consequences

Consultation with the Oregon Historic Preservation Office under Section 106 of the National Historic Preservation Act of 1966 has confirmed that the proposed action for construction of a Dairy Digester at the POTB Industrial Site would not have any effects on cultural resources (Appendix A).

4.11 SOILS AND GEOLOGY

4.11.1 Affected Environment

Situated in a rich alluvial plain, soils in the vicinity of the proposed project are used for agricultural purposes. Derived from basalt and sandstone-shale bedrock, these deep, level soils of the coastal floodplain have been deposited over thousands of years by streams and rivers. Originally these soils were almost all forested, but most have been cleared and used for hay and pasture.

4.11.2 Environmental Consequences

The soils at the construction site are covered with a concrete foundation of the former blimp hangar. Soils at the proposed project site and adjacent properties would not be disturbed by construction and operational activities.

4.12 NOISE

4.12.1 Affected Environment

The POTB Industrial Park is primarily associated with noise sources from vehicular traffic, manufacturing operations, and tour and UPS airplanes. Even with the occasional delivery airplanes, the noise levels at the POTB are generally in the 75-90 dB range (see Table 5).

4.12.2 Environmental Consequences

During construction activities, the noise would be localized, intermittent, and temporary. All construction activities would be limited to normal working hours during the daytime and completed within a six-month period. Given the equipment needs of the construction phase, the noise level would not be expected to rise above the existing 75-90 dB range.

Normal operation of the proposed Dairy Digester would result in types and levels of noise similar to those currently generated at the industrial park. The principal noise sources associated with operation of the Dairy Digester would be from the two reciprocating engines located within the concrete structure, and the walls of the building would attenuate this noise.

Table 6. Common Noise Levels

The loudness of sound is measured in units of decibels (dB); loudness as heard by the human ear is measured on the A-weighted dB scale (dBA). An increase of one dB equals 30% more noise energy. A few examples comparing familiar noises and their exposure concerns are as follows:

Source*	dB	Concern
Soft Whisper	30	None. Normal safe levels
Quite Office	40	
Average Home	50	
Conversational Speech	66	
Busy Traffic	75	May affect hearing in some individuals, depending on sensitivity, exposure duration, etc.
Noisy Restaurant	80	
Average Factory	80-90	
Pneumatic Drill	100	Continued exposure to noise over 90 dB may eventually cause hearing impairment
Automobile Horn	120	
Jet Plane	140	Exposure to noise at or over 140 dB may cause pain
Gunshot	140	

*Noise and You, Channing Bete Co., South Deefield, MA, 1985.

5.0 REGULATORY COMPLIANCE ISSUES

Previous sections have discussed the major Federal and state regulations involved with construction and operation of the POTB Dairy Digester, including the CAA of 1990 and the Water Pollution Control Act, as implemented by the Oregon DOA. Interviews with Federal and state regulators indicated some uncertainties with the required permits. The key issue is that a centralized, off-farm digester operation falls outside of the typical solid waste and water control regulatory constructs and historical permits. The cow manure (or solid waste) would leave the farm boundaries, regulated by the CAFO permit, and be transported to the digester, where manure would be "processed" at another site. Since the manure would be processed on-site at the POTB and returned to the farm in a different form (i.e., nutrient-rich liquid), the Federal and state authorities governing solid waste and water quality at individual sites are being evaluated.

The DEQ Solid Waste Division is evaluating the need for a solid waste permit for the POTB Dairy Digester even though these regulations were primarily intended for landfill operation and management. The regulators mentioned that the movement of solid waste to and from the farms would not be regulated under existing permits [Interviews 4 and 14]. In addition, a separate solid waste permit would be required for the compost facility. Pro-Gro already has a limited permit for composting activities used for pilot plots conducted over the last 12 months at the POTB.

The DEQ has also raised some concerns over the land application of the nutrient-rich liquid when it returns to the farm. There was question about whether the existing on-farm CAFO permits cover the effects of this liquid on nearby streams or whether a separate water quality permit would be required for each farm participating in the digester project [Interview 14]. Most recently, the Oregon DOA has raised some issues regarding other regulatory requirements that need to be assessed for on-farm operations. Given the change in the nature of nutrient levels compared to conventionally stored and treated manure, the Oregon DOA may require participating dairies to provide revised waste management plans. A letter received from their Natural Resources Division stated that these "plans will account for the chemical composition and strength of the nutrients in the digested materials, and address the timing and rate of land applications such that applied nutrients are appropriately matched to crop growth stage and nutrient uptake" (Appendix A).

In light of these concerns, the POTB convened a meeting in August 2001 between the Federal and state regulators to discuss how to streamline these permit requirements and still meet the intent of the law [Interview 5]. For example, one solid waste permit may be considered for both the Dairy Digester and the compost facility, but a separate solid waste permit would be submitted by the POTB to operate the Dairy Digesters. This permit would need to be approved by the Oregon DEQ before operations begin. In regards to water quality impacts from land application of manure, since it is now regulated under the CAFO permit, the oversight of the nutrient-rich liquid would fall within the purview of the DOA. A separate water quality permit would not be required. Regardless of the final solution, the POTB Dairy Digester would comply with all of the permit and oversight requirements as set forth by the Federal and state agency representatives.

6.0 CUMULATIVE EFFECTS AND LONG-TERM ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

This section of the EA analyzes potential cumulative impacts to selected resource areas described in sections of Chapter 4. The effects associated with the proposed Dairy Digester are analyzed for their incremental contribution to cumulative effects when added to other reasonably foreseeable past, present, and future actions. For an affected resource, each reasonably foreseeable future action, including the proposed action, adds an increment to the total (cumulative) impact. For this analysis, the past and present effects are accounted for in the existing baseline or the affected environment sections of this EA.

Reasonably foreseeable future actions include the proposed action and other actions with a reasonable likelihood to occur within a planning time frame established for the cumulative effects analysis. For future actions to be relevant to the cumulative effects analysis, the actions must affect resources (be the cause of some type of effect whether beneficial or adverse) within the region of influence for the analysis. The region of influence for this project, as stated in Section 2.2, Scope of the EA, is the Tillamook Watershed and County. The analysis considered a 5-year planning horizon for the POTB projects.

The POTB Master Plan identifies various construction projects that are reasonably foreseeable, including an 18-hole golf course and a convention center [Crider, 5/2/01]. Construction of a twin digester has been suggested for the same concrete pad in the near future. If additional digesters were constructed in Tillamook County, they would be dispersed and difficult to analyze for potential cumulative impacts. It is not likely that several more would be built in the next five years. In light of the past, present and future actions, the following resources were analyzed for cumulative effects: air, socioeconomics, and water quality.

For air resources, additional engine generators and emissions from a dairy digester involving another 2,000 cows would trigger a review of the proposed discharge permit. However, the expected emissions from an additional two reciprocating engines would not exceed the CAA thresholds under Oregon state law. It is likely that there would be some substantial air quality benefits by offsetting the adverse impacts of releasing CO_2 and methane from land application of raw manure.

Adding 2,000 cows to the manure processing facility would potentially have a beneficial effect on water quality in the Tillamook Watershed. But, as mentioned in Chapter 4, the impact would depend on the location of these farms in relation to the rivers and streams flowing into the Tillamook Bay and its tributaries. With the additional farms (estimated at 5-7) participating in the new twin digester, there would be approximately 10-14 farms involved and upward of 4,000 cows—about 12-15 percent of all cows in the county. This could have a measurable beneficial effect on reducing the pathogen levels in the rivers and streams and enhancing water quality.

The construction of an 18-hole golf course would have potential immediate effects on transportation and local employment. The access roads to the golf course would have a different entry and egress, but additional traffic would be expected in the immediate vicinity. The golf course would employ about 15-20 staff, some of which would already be employed at POTB. The additional employment

would have a minimal effect on total employment, as it would involve less than 0.5 percent of the Tillamook population. The potential deleterious effects would stem from the construction, maintenance, and operations of the course. In order to build the golf course, some forested lands and wildlife habitat would be lost. The maintenance and operation would require application of pesticides and commercial fertilizers that would contribute to the runoff of pollutants into Tillamook Bay and the Watershed. The potential effect may offset the water quality benefits of the Dairy Digester, if both projects are located in the same watershed.

7.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The irreversible and irretrievable commitments of resources for the proposed action are the energy and materials that would not be reclaimed, reused, or recycled during construction or operation of the proposed Dairy Digester. During operation, propane and/or natural gas would be used during the start-up phase. Use of these resources would not compromise long-term productivity.

8.0 SIMILAR ACTIONS AND ACTIONS BEING CONSIDERED UNDER OTHER NEPA REVIEWS

The proposed action is not related to other actions currently in process or actions being considered under other NEPA reviews.

9.0 REFERENCES

Andrews, Dave of Pro-Grow Letter to Jack Crider Port of Tillamook Bay. 5/15/01. Proposal to Purchase Digester Fiber.

Crider, Jack of Port of Tillamook Bay Letter to Oregon DEQ. 5/2/01. Power Generation Facility Air Quality Discharge Permit Application

Oregon DEQ Letter from George Davis to Jack Crider of Port of Tillamook Bay. 5/17/01. Construction Approval of Notice of Intent to Construct.

Mattocks, R.P. of RCM, Inc. Letter to Janet Farstad of Port of Tillamook Bay. 4/18/01. Cogenerator Equipment Specification.

Mattocks, R.P. of RCM, Inc. E-mail to Jack Crider of Port of Tillamook Bay. 6/8/01. Digester DEQ Permitting.

Norwest Engineering. 11/95. Biowaste Treatment Plant, Phase 1 – Site Development and Environmental Assessments.

Oregon Department of Agriculture, Food Safety Division, Shellfish Sanitation Program. 1999. Shellfish Growing Area Annual Evaluation.

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Oregon Office of Energy. 9/98. Anaerobic Digester at Craven Farms – A Case Study.

PBS Environmental. 6/00. Phase I Landfill Site Characterization, Tillamook Lumber Landfill Solid Waste Disposal Site 1132.

Port of Tillamook. 2/26/97. DRAFT – Wetland Determination for the Port of Tillamook Bay Industrial Park in Tillamook, Oregon. Prepared by Cary, D., Fukuda, J., and Colin MacLaren of SRI/SHAPIRO/AGCO, Inc

Resource Conservation Management, Inc. March 2001 and June 2001. Proposal for Consulting Services for a Dairy Manure Digester Facility at Port of Tillamook Bay Tillamook, Oregon.

Unisyn Biowaste Technology, Anaerobic Digestion Facility Preconstruction Study (3/92) and Unisyn and the Harris Group Inc. Site Feasibility, Environmental Assessment, and Capital Cost Estimate (Report No. 91-2787/1) (10/91).

U.S. Department of Agriculture (DOA), Natural Resource Conservation Service (NRCS), 6/01/01. Watershed Plan and Environmental Assessment, Lower Tillamook Bay Watershed Plan, Tillamook, OR.

U.S. DOE and U.S. DOA. 2/14/00. Report to the President of the United Sates in Response to Executive Order 13134: "Developing and Promoting Biobased Products and Bioenergy."

U.S. EPA, Atmospheric Pollution Prevention Division. 7/97. A Manual for Developing Biogas Systems at Commercial Farms in the United States – AgSTAR Handbook. Ed. K.F. Roos and M.A. Moser. EPA-430-97-015.

U.S. EPA. 12/99. Tillamook Bay Comprehensive Conservation and Management Plan "Restoring the Balance."

10.0 LIST OF AGENCIES AND INDIVIDUALS CONTACTED

1. Dave Andrews, Pro-Gro Headquarters
2. Deb Cannon, Food Safety Division, USDA
3. Will Charlton, Pro-Gro, On-site at POTB
4. Cory-Ann Chang, Air Quality Division, DEQ
5. Jack Crider, POTB, Port Manager and Registered Agent
6. Rich Felley, National Estuarine Program, Tillamook County Performance Partnership
7. John Howorth, Engineering Manager, Tillamook Public Utility District
8. Chris Knutsen, Habitat Protection Biologist, Oregon Department of Fish and Wildlife
9. Richard Mattocks, RCM, Digester Designers, Inc.
10. Robert Miller, POTB Environmental Manager
11. Joel Palmer, CAFO Program Administrator, Oregon State Department of Agriculture (DOA), Natural Resource Division
12. Patricia Parrish, Tillamook Field Office, OR DOA
13. Bob Pederson, North Coast Basin Leader, Resource Conservationist, National Resource Conservation Service, USDA
14. Mark Reeves, Senior Environmental Engineer, Solid Waste Program, DEQ
15. Sean Reiersgaard, TCCA, Environmental Manager
16. Harold Shields, Tillamook County Creamery Association
17. Timothy Sullivan, President, E&S Environmental Chemistry, Inc
18. George Urrey, Traffic Engineer, Public Works Department, Tillamook County

APPENDIX A: AGENCY COORDINATION LETTERS

Oregon
John A. Kitzhaber, M.D., Governor

Parks and Recreation Department
State Historic Preservation Office
1115 Commercial St. NE
Salem, OR 97301-1012
(503) 378-4168
FAX (503) 378-6447

September 7, 2001

File Code: Tillamook

Lloyd Lorenzi, Jr.
U.S. Department of Energy
P.O. Box 10940
Pittsburgh, PA 15236-0940

RE: Dairy Digester Project
Port of Tillamook Bay
Tillamook, Tillamook County

Dear Mr. Lorenzi:

Thank you for your submission of additional documentation for the project referenced above. This information was submitted in compliance with the National Historic Preservation Act of 1966 (16 U.S.C. 470f), Section 106, and reviewed under criteria and procedures outlined in 36 CFR Part 800. Further consultation and comment was also solicited from appropriate SHPO program staff. This review resulted in the following determination:

> **"No Historic Properties Affected."** There are no historic properties present, or there are historic properties present but the proposed undertaking will have no effect on them as defined in 36 CFR 800.16(i).

If you have further questions or need additional assistance, please feel free to contact me at the SHPO, extension 229.

Sincerely,

Christine Curran
Preservation Specialist

73410-0807

Oregon
John A. Kitzhaber, M.D., Governor

Department of Agriculture
635 Capitol Street NE
Salem, OR 97301-2532

August 13, 2001

Lloyd Lorenzi, Jr.
NEPA Compliance Officer
U.S. Department of Energy
National Energy Technology Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, Pennsylvania 15236-0940

Re: Port of Tillamook Bay Dairy Digester Project

Dear Mr. Lorenzi:

Thank you for the preliminary information on the proposed project. The Oregon Department of Agriculture supports such efforts to increase the options available to livestock producers for manure management. As you may know, the department is charged with regulating manure handling and land application of wastes on confined animal feeding operations for compliance with water quality laws. In this regard we would like to bring your attention to the following issues:

1) It is our understanding that the digestion process has significant effects on the nutrient content and chemical make-up of the solid and liquid fractions of the manure. These effects have important consequences in the way this material must be handled to minimize potential adverse impacts on water quality when it is returned to the dairies. We would appreciate any information you can provide on nutrient content and form of the digested solids and effluent.

2) From our understanding of the project, dairies receiving digester effluent will need additional, separate storage facilities. These facilities require plan review and construction approval from the department. It is important that participating dairies understand the full extent to which their infrastructure will require modification, and account for the time necessary to produce construction plans and specifications, schedule construction services, and obtain necessary permits and approvals.

3) Because of the change in the nature of nutrients in digested solids and effluent compared to conventionally stored and treated manure, participating dairies may be required by the department to provide revised animal waste management plans. These plans will account for the chemical composition and strength of the nutrients in the digested material, and address the timing and rate of land

applications such that applied nutrients are appropriately matched to crop growth stage and nutrient uptake. The plans will address related issues such as testing of applied materials for nutrient content, soil testing for residual nutrients, measurement of crop yield, and calibration of application equipment.

Thank you for the opportunity to review and comment on your document. We look forward to learning more about the project as it moves forward.

Sincerely,

Debbie Gorham, Administrator
Natural Resources Division
PH (503) 986-4700
FX (503) 986-4730

DG/jp/cw

ODA:Natural Resources:CAFO:CAFO General:01.08.09 DOE/Tilla digester ltr Page 2 of 2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oregon Fish and Wildlife Office
2600 S.E. 98th Avenue, Suite 100
Portland, Oregon 97266
(503) 231-6179 FAX: (503) 231-6195

Reply To: 8330.10641(01)
File Name: Sp1064.wpd
OARS Number: 01-3955

August 28, 2001

Lloyd Lorenzi
U.S. Department of Energy
National Energy Technology Laboratory
P.O. Box 10940
Pittsburgh, PA 15236-0940

Subject: Tillamook Bay Dairy Digester Project (1-7-01-SP-1064).

Dear Mr. Lorenzi:

This is in response to your letter, dated July 23, 2001, requesting information on listed and proposed endangered and threatened species that may be present within the area of the Tillamook Bay Dairy Digester Project in Tillamook County. The U.S. Fish and Wildlife Service (Service) received your correspondence on July 27, 2001.

We have attached a list (Attachment A) of threatened and endangered species that may occur within the area of the Tillamook Bay Dairy Digester Project. The list fulfills the requirement of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). U.S. Department of Energy (DOE) requirements under the Act are outlined in Attachment B.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems on which they depend may be conserved. Under section 7(a)(1) and 7(a)(2) of the Act and pursuant to 50 CFR 402 *et seq.*, DOE is required to utilize their authorities to carry out programs which further species conservation and to determine whether projects may affect threatened and endangered species, and/or critical habitat. A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) which are major Federal actions significantly affecting the quality of the human environment as defined in NEPA (42 U.S.C. 4332 (2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to the Biological Assessment be prepared to determine whether they may affect listed and proposed species. Recommended contents of a Biological Assessment are described in Attachment B, as well as 50 CFR 402.12.

If DOE determines, based on the Biological Assessment or evaluation, that threatened and endangered species and/or critical habitat may be affected by the project, DOE is required to consult with the Service following the requirements of 50 CFR 402 which implement the Act.

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Attachment A includes a list of candidate species under review for listing. The list reflects changes to the candidate species list published October 25, 1999, in the Federal Register (Vol. 64, No. 205, 57534) and the addition of "species of concern." Candidate species have no protection under the Act but are included for consideration as it is possible candidates could be listed prior to project completion. Species of concern are those taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

If a proposed project may affect only candidate species or species of concern, DOE is not required to perform a Biological Assessment or evaluation or consult with the Service. However, the Service recommends addressing potential impacts to these species in order to prevent future conflicts. Therefore, if early evaluation of the project indicates that it is likely to adversely impact a candidate species or species of concern, DOE may wish to request technical assistance from this office.

Your interest in endangered species is appreciated. The Service encourages DOE to investigate opportunities for incorporating conservation of threatened and endangered species into project planning processes as a means of complying with the Act. If you have questions regarding your responsibilities under the Act, please contact Cindy Bright or Andy Robinson at (503) 231-6179. For questions regarding anadromous fish, please contact National Marine Fisheries Service, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232, (503) 230-5400. All correspondence should include the above referenced file number.

Sincerely,

for Kemper M. McMaster
State Supervisor

Attachments
1-7-01-SP-1064

cc: OFWO-ES
ODFW (nongame)
cc:

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ATTACHMENT A

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CANDIDATE SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR WITHIN THE AREA OF THE TILLAMOOK BAY DAIRY DIGESTER PROJECT
1-7-01-SP-1064

LISTED SPECIES[1/]		
Birds		
Bald eagle[2/]	*Haliaeetus leucocephalus*	T
Fish		
Coho salmon (Oregon Coast)[3/]	*Oncorhynchus kisutch*	**T
PROPOSED SPECIES		
None		
CANDIDATE SPECIES		
Fish		
Steelhead (Oregon Coast)[4/]	*Oncorhynchus mykiss*	**CF
SPECIES OF CONCERN		
Mammals		
White-footed vole	*Arborimus albipes*	
Pacific big-eared bat	*Corynorhinus (=Plecotus) townsendii townsendii*	
Silver-haired bat	*Lasionycteris noctivagans*	
Long-eared myotis (bat)	*Myotis evotis*	
Fringed myotis (bat)	*Myotis thysanodes*	
Long-legged myotis (bat)	*Myotis volans*	
Yuma myotis (bat)	*Myotis yumanensis*	
Birds		
Purple martin	*Progne subis*	
Amphibians and Reptiles		
Tailed frog	*Ascaphus truei*	
Northwestern pond turtle	*Clemmys marmorata marmorata*	
Northern red-legged frog	*Rana aurora aurora*	
Fish		
River lamprey	*Lampetra ayresi*	
Pacific lamprey	*Lampetra tridentata*	
Coastal cutthroat trout (Oregon Coast)	*Oncorhynchus clarki clarki*	
Plants		
Frigid shootingstar	*Dodecatheon austrofrigidum*	
Queen-of-the-forest	*Filipendula occidentalis*	
Moss	*Limbella fryei*	
Bristly-stemmed sidalcea	*Sidalcea hirtipes*	

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(E) - Listed Endangered *(T) - Listed Threatened* *(CH) - Critical Habitat has been designated for this species*
(PE) - Proposed Endangered *(PT) - Proposed Threatened* *(PCH) - Critical Habitat has been proposed for this species*

Species of Concern - Taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

(CF) - Candidate: National Marine Fisheries Service designation for any species being considered by the Secretary for listing for endangered or threatened species, but not yet the subject of a proposed rule.

** *Consultation with National Marine Fisheries Service may be required.*

U. S. Department of Interior, Fish and Wildlife Service, October 31, 2000, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12

Federal Register Vol. 60, No. 133, July 12, 1995 - Final Rule - Bald Eagle

Federal Register Vol. 63, No. 153, August 10, 1998, Final Rule-Oregon Coast Coho Salmon

Federal Register Vol. 63, No. 53, March 19, 1998, Final Rule-West Coast Steelhead

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ATTACHMENT B

FEDERAL AGENCIES RESPONSIBILITIES UNDER SECTION 7(a) and (c)
OF THE ENDANGERED SPECIES ACT

SECTION 7(a)-Consultation/Conference

Requires:

1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of Critical Habitat. The process is initiated by the Federal agency after they have determined if their action may affect (adversely or beneficially) a listed species; and

3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed Critical Habitat.

SECTION 7(c)-Biological Assessment for Major Construction Projects[1]

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify proposed and/or listed species which are/is likely to be affected by a construction project. The process is initiated by a Federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the species list should be informally verified with our Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should: (1) conduct an on-site inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or for potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within FWS, National Marine Fisheries Service, State conservation departments, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed species will be affected. Upon completion, the report should be forwarded to our Portland Office.

[1]A construction project (or other undertaking having similar physical impacts) which is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332. (2)c). On projects other that construction, it is suggested that a biological evaluation similar to the biological assessment be undertaken to conserve species influenced by the Endangered Species Act.